



A.D. 1823 N^o 4746.

S P E C I F I C A T I O N

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JAMES NEVILLE.

FURNACES, FLUES, AND APPARATUS FOR
VENTILATING THE LATTER.

L O N D O N :

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Furnaces, Flues, and Apparatus for Ventilating the latter.

NEVILLE'S SPECIFICATION.

TO ALL TO WHOM THESE PRESENTS SHALL COME, I, JAMES NEVILLE, of New Walk, Shad Thames, in the County of Surrey, Civil Engineer, send greeting.

WHEREAS His most Excellent Majesty George the Fourth, by His Letters
5 Patent under the Great Seal of Great Britain, bearing date on or about the
Eighth day of January, in the third year of His reign, did, for Himself, His
heirs and successors, give and grant unto me, the said James Neville, my execu-
tors, administrators, and assigns, His special license, full power, sole privilege,
and authority, that I and they, by myself and themselves, or by my or their
10 deputy and deputies, servants and agents, or such others as I and they should at
any time agree with, and no others, from time to time and at all times thereafter
during the term of fourteen years therein expressed, should and lawfully might
make, use, exercise, and vend, within that part of His Majesty's United Kingdom
of Great Britain and Ireland called England, His Dominion of Wales, Town of
15 Berwick upon Tweed, and also in all His Colonies and Plantations abroad, my
Invention of "**AN IMPROVED METHOD OF PRODUCING AND APPLYING HEAT TO AND
CONSTRUCTING AND ERECTING FURNACES AND OTHER RESERVOIRS, SEVERALLY USED FOR
THE VARIOUS PURPOSES OF ROASTING OR SMELTING METALLIC ORES OR OTHER SUB-
STANCES, MELTING METALS OR ANY OTHER MATTER, AND FOR HEATING PANS OR
20 BOILERS, OR SUBSTANCES USUALLY CONTAINED IN PANS OR BOILERS, IN THE VARIOUS
OPERATIONS OF PRODUCING STEAM, DISTILLING, BREWING, DYING, BOILING OR BAKING
SUGAR, BOILING SOAP, OR ANY OTHER MANIPULATION OR OPERATION IN WHICH THE**

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APPLICATION OF HEAT IS NECESSARY; AND ALSO FOR THE PURPOSE OF PRODUCING AND APPLYING HEAT TO FURNACES, PANS, BOILERS, AND RESERVOIRS ALREADY ERECTED, USED, OR TO BE USED FOR THE PURPOSES ABOVE MENTIONED, AND LIKEWISE FOR EFFECTING A SAVING IN FUEL, AND PRODUCING A MORE COMPLETE COMBUSTION OF SMOKE THAN AT PRESENT TAKES PLACE, AS WELL AS A BETTER MODE THAN ANY NOW IN USE OF COLLECT- 5
ING AND PRESERVING ANY VOLATILE SUBSTANCE CONTAINED IN OR COMBINED WITH METALLIC ORES OR OTHER SUBSTANCES, IN THE SEPARATION OF WHICH HEAT IS NECESSARY; AND FOR THE PURPOSE OF APPLYING HEAT TO THE OPERATIONS OF BAKING OR DRYING SUBSTANCES IN KILNS, ON FLOORS OR RACKS, OR IN OVENS," to hold the said license, powers, privileges, and advantages to me, my executors, administrators, 10
and assigns, for and during the said term of fourteen years from the date of the said Letters Patent immediately ensuing; and in which said Letters Patent is contained a proviso that if I, the said James Neville, shall not particularly describe and ascertain the nature of my said Invention, and in what manner the same is to be performed, by an instrument in writing under my hand and 15
seal, to be inrolled in His Majesty's High Court of Chancery within six calendar months next and immediately after the date of the said Letters Patent, that then the said Letters Patent, and all liberties and advantages whatsoever thereby granted, should utterly cease, determine, and become void, anything therein contained to the contrary thereof in anywise notwithstanding. 20

NOW KNOW YE, that in compliance with the said proviso, I, the said James Neville, do hereby declare that the nature of my said Invention, and the manner in which the same is to be performed, is particularly described and ascertained in the explanation now next following (that is to say):—

I declare and describe the nature of my said improvements to be as follows: 25
firstly, in order to encrease the intensity of the heat and produce a more perfect combustion of the fuel employed for any of the purposes or operations before recited, I create and apply an artificial draught in the following manner:—At any convenient distance from the furnace or fire-place where the fuel is to be consumed, and from whence there is to be a communication by 30
means of an horizontal or other flue or enclosed passage, I place a revolving fan, which is formed by any number of metallic planes or surfaces affixed to sheet iron or copper sides, one of which is carried on the axis or spindle by a cast iron ring, with arms, as shewn by B, Fig^s 1, 2, and 3, and leaving an open aperture in the centre of one of the sides of sufficient area for the intended 35
draught; the opposite side is connected to the axis or spindle by the cast iron boss C, Fig. 2, and that side is perfectly closed; these planes are placed at equal distances from the centre of such axis or spindle, and their form and positions are shewn in the said Figure by the letters c, c, c, c; this fan or set

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of flies I place in a case formed of cast or wrought iron, or any other suitable material; the circumference of such case forms a spiral line commencing at *d*, Fig. 3, and uniformly receding from the centre *a*, until it terminates at *e*, leaving an opening between *d* and *e* of sufficient capacity for the intended draught; one side of this case is closed by a metal or other plate, and there is a small hole in the centre at *a*, Fig. 2, through which the axis or spindle of the fan passes; the opposite side of this case is likewise enclosed by a similar plate, in the centre of which there is a circular hole or aperture of sufficient capacity for the cast iron ring B to revolve therein, and to which hole there is affixed a tube or cylinder of equal diameter, for the purpose of connecting the said case with the flue or flues leading from the furnace or fire-place; the dotted lines in Figs 1 and 3 represent flies of the fan, which, together with the sides, are at liberty to revolve freely in the said case or enclosed space; the axis or spindle *a* is mounted and carried by a double set of plummet blocks, as shewn by *f, f*, Fig. 2, and motion may be communicated thereto by means of a strop attached to the pulley or rigger *g*, Fig. 2, or by any other contrivance or application; the letters *h, h*, in Fig. 2, represent the sides of the enclosed case; *i, i, i, i*, is the passage for the introduction or admission of the draught, and *c*, the place of delivery; the light shaded surfaces *c, c, c, c*, in this Figure represent the form and position of the metallic plates or planes connected to the spindle *a* by means of the sides *p, p, p, p*; on motion being communicated in a circular direction to the said fan, a current or draught will be produced through the tube or opening within the ring B, and the centrifugal force arising from such revolving motion will cause any elastic fluid so introduced at B to be expelled through the aperture C. By this application I am enabled to increase the intensity of the draught (according to the speed communicated to the fan), and at the same time to retain or apply for usual purposes a greater portion of the heat so produced by the more rapid and perfect combustion of the fuel, instead of letting it escape up a chimney, which, according to the present practice, becomes necessary for the production and maintenance of the required draught. Though the operation of such a fan or set of revolving flies is familiar and well known for cleansing corn and other purposes, yet I claim the exclusive right in all cases of its application for drawing or forcing atmospheric air through fuel, in order to promote combustion either in the form herein described (which I consider the best) or any other where such draught shall be produced by the centrifugal force of air or gases urged by revolving planes or moving surfaces. Fig. 4 represents a plan of such furnace at the end of the fire bars, which are rather shorter than usual. I place an inclined plane of fire bricks, about eighteen inches deep, and running

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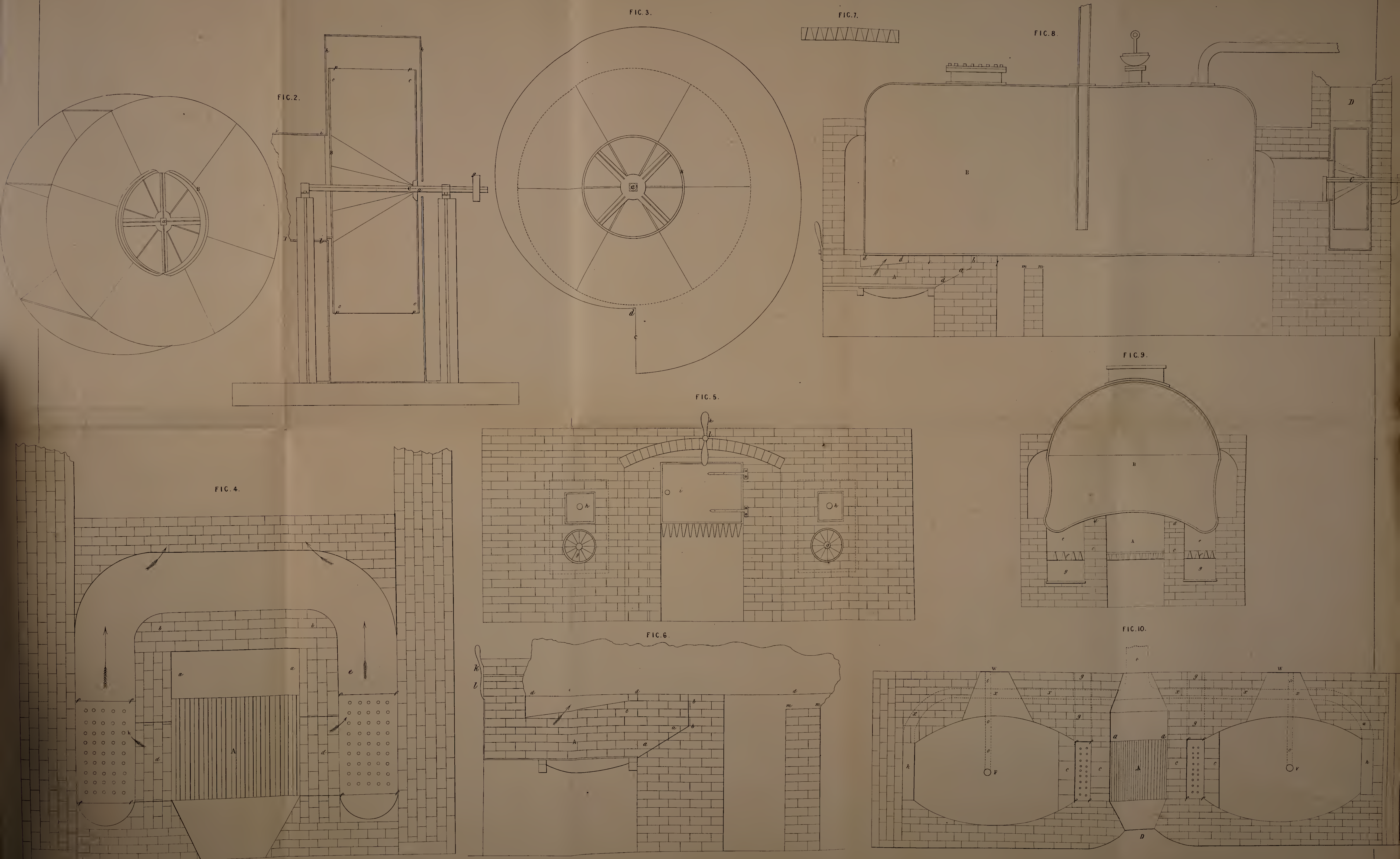
the entire breadth of the bars, as shewn by *a, a*, Fig^s 4 and 6, behind which wall *b, b*, rises, and which is continued on each side of the fire-place by the walls *c, c*, thus enclosing the ends and both sides of the said fire-place; in each side wall *c, c*, I have an oblong aperture *d, d, d, d*, Fig^s 4 and 6, about six inches high and two feet long, or in any other similar proportion, according to 5 the size of the fire-place and the space required for the necessary draught; these apertures communicate with the side flues *e, e, e, e*, Fig. 4, which I make about nine inches deep and half the width of the fire-place; near the bottom of each flue *e, e, e, e*, I place a plate of cast iron or fire tile *f, f, f, f*, Fig. 4, about two feet long and the entire width of the said flues; these plates or tiles 10 are perforated with a sufficient number of conical holes, each about half an inch diameter at the upper surface of the plate, and one inch diameter at the bottom, the plates or tiles being about $2\frac{1}{2}$ inches thick, as shewn by the section, Fig. 7. Beneath these plates or tiles there is an open passage for the admission of air; the quantity of air is regulated by the registers *g, g*, Fig. 5, 15 above which are placed two iron doors, *h, h*, Fig. 5, for cleaning the flues *e, e, e, e*, Fig. 4, if required. In front of the feeding door *i*, Fig^s 5 and 6, I place the lever *k*, moving on the centre *l*, Fig^s 5 and 6, and which is connected to a damper, placed in any convenient situation, so that the said door cannot be opened without moving the lever *k*, and diminishing 20 the draught during the period of supplying fuel or clearing the bars. Fig. 8 represents the section of a steam engine boiler erected on this principle. A is the furnace or fire-place, as above described; B, the boiler; C, the fan for producing the draught, which is placed in any convenient situation for driving the same by a strop from the engine; and D, a short shaft or chimney 25 for carrying off the gases produced by the combustion of the fuel. The operation of this application is as follows:—After the fire is lighted, the supply of fresh fuel is to be thrown as far back as possible, until it strikes the back of the fire-place *b, b*, and falls on the inclined plane *a, a*, where the smoke and gases become gradually disengaged, and pass over the ignited fuel on the bars 30 in the direction of the arrow shewn in this section, and thence through the oblong apertures *d, d*, Fig. 8; the smoke, &c. is thus drawn in a thin sheet into the said flues *e, e*, Fig. 9, where a current of air ascends through the conical apertures in the plates or tiles *f, f, f, f*, as described and represented in Figs. 4 and 9, the supply of such air being regulated by the registers *g, g*, 35 shewn in Fig. 5; from the intensity of the draught created by the fan C, the holes in the plate *f, f, f, f*, Fig^s 4 and 9, act as blow pipes, and produce a perfect combustion of the smoke and a more intense heat against that part of the boiler which covers the flues *e, e*, Fig. 9. After the flame and heated

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gases pass from these flues they are spread under the boiler by the bridge *m, m*, Fig. 8, which is formed on the top to correspond with the curve of the bottom of the boiler, allowing a sufficient passage for the draught, and in other respects the setting of the boiler is similar to the common mode. I
5 employ the waste or remaining heat, after it has passed under, through, or round the boiler, for heating water, or for producing steam in a second boiler, or for heating factories, stoves, or drying lofts, or to any other useful purpose where a moderate temperature may be required, instead of permitting the escape of such heat up a chimney, which at present is requisite for the main-
10 tenance of the required draught, such applications being too obvious to require any description. Fig. 9 shews a section of the front of the steam boiler set on this plan: *a*, the fire-place; *c, c*, the side walls; *e, e*, the flues; *d, d*, the apertures for the draught; *f, f, f, f*, the perforated plates or tiles; and *g, g*, the air passages leading thereto. The foregoing improvements for the more rapid
15 and perfect combustion of the fuel, and mode of producing a draught, I also apply for the purposes of roasting, calcining, and smelting metallic ores, melting metals, and other operations where high temperatures are required; also for separating, and in some cases retaining or preserving for use, the volatile materials contained in or combined with such metallic ores, and for saving a
20 considerable portion of fuel, and in most cases for preventing the discharge or dissemination of the noxious vapours created by such operations for such purposes. I cause the flame, heated air, or gases to pass or be carried through several furnaces, kilns, or ovens in succession by means of the draught produced by the application of the fan as before described, thereby employing the action
25 of such heat for the purposes of smelting, roasting, calcining, baking, or drying such metallic ores, or other substances, so long as the temperature may be found useful or applicable for such purposes or operations; or I arrange or erect such furnaces, kilns, or ovens in such manner or positions so that the heat may be applied or conveyed alternately thereto by means of dampers or
30 other contrivances, according to the intensity of the temperature required, employing at the same time the waste or remaining heat for gradually heating adjoining furnaces, kilns, or ovens, or the substances contained therein, or for evaporating water or other fluids, or for any other purpose or object to which such water or remaining heat may be usefully applied, instead of permitting
35 the same to escape up a chimney, as at present practiced. And in order to preserve or retain or prevent the escape of any volatile materials contained in or combined with such metallic ores or other substances, and which are usually expelled or separated therefrom in a gaseous form, form by means of heat, I cause such vapours or gases or sublimed particles to pass or be conveyed by
40 the draught created in the manner before described through horizontal or other

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flues or chambers of sufficient capacity or dimensions, where the said gases, &c. may become absorbed or condensed. And in certain instances I cover the said flues or chambers with thin metallic pans or plates, which are kept cool by water contained therein or applied thereto, in order to facilitate the condensation of the said vapours or gases; and for the better absorbtion and condensation 5 of which I cause, where necessary, a shower of water or lime water, or water saturated or combined by any proper material, to fall or descend through pierced metallic or other plates into the said flues or chambers, where I also place a number of inclined planes, formed of thin metallic plates, or any suitable material, to intercept the said shower of water, &c., and thereby 10 expose a greater condensing surface to the action of the said gases, which I cause to pass over or between these planes or surfaces by means of the draught created in the manner before described. Fig. 10 represents a plan of a double reverbratory furnace; the fire-place A is similar to that already described, except that the fuel is supplied through the feeding or teasing hole *t*, and 15 descends on the inclined plane of fire-brick *a, a*, until it covers the fire bars; on the opposite side I place the door D, for the purpose of clearing the bars and raking forward the fuel when required; the flame and smoke pass over the bridges *c, c, c, c*, in the centre of which I place the two perforated fire tiles *f, f, f, f*; these have a sufficient number of conical apertures, and are 20 similar to the plates or tiles *f, f*, described in Figs 4, 7, and 9. A current of air is introduced through the passages shewn by the dotted lines *g, g, g, g*, Fig. 10, the supply of which is regulated by registers placed at the entrance of such passages; the apertures in these tiles act as blow pipes, and increase the intensity of the heat, and effect a more perfect combustion of the smoke; 25 the flame passes through the furnaces F, F, and descends through the flues *h, h*, Fig. 10, or where it is desired, I carry it through any number of such furnaces before it descends to the horizontal flues shewn by the dotted lines *x, x, x, x, x, x*, Fig. 10, which may be connected with condensing chambers or flues at any distance, either before or after the vapours or gases have passed 30 the fan, as before described. The furnaces F, F, Fig. 10, have working doors W, W, and the tap holes for drawing off their charges, as shewn by the dotted lines *o, o, o, o, o, o*, Fig. 10, and the respective flues to these furnaces are furnished with dampers for regulating the draught, or for working these furnaces alternately or separately when required. I further employ the afore- 35 said improvements in the construction of the fire-place and the mode of creating an artificial draught, as explained by the Figs. 1, 2, 3, 4, 5, and 6, to brewers' coppers, stills, sugar pans, and every other description of boiler, pan, copper, or reservoir severally used or employed for heating, boiling, or evaporating fluids or other substances; and I also employ, where required, any waste or 40



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remaining heat which may pass or escape from the fire after heating such pans, boilers, or reservoirs for heating factories or drying substances contained in drying lofts, stoves, kilns, &c., in the various operations of sugar baking, malting, salt refining, paper making, and for every other object where the
 5 application of a moderate temperature may be desired. And I disclaim as being new, or forming any part of my said Invention, the form or arrangement of boilers or furnaces, or the condensation of vapours or gases by means of water or otherwise, except so far as the same depend or are connected with my improvements for the combustion of smoke, the saving of fuel, and the method
 10 of producing a mechanical draught, as herein described. And I further declare that I vary the shape and situation of my fire-place, flues, fan, and fan case, according to convenience and circumstances, and I construct them of materials varied and best adapted to the purposes for which they are severally applied, varying their forms and dimensions as best suited for the different
 15 objects and purposes to which the Inventions herein-before defined and described are applicable, and I use the several parts of it either connected or separate, as circumstances may require.

In witness whereof, I, the said James Neville, have hereunto set my hand and seal, this Seventh day of July, in the year of our Lord One
 20 thousand eight hundred and twenty-three.

JAMES (L.S.) NEVILLE.

Signed, sealed, and delivered in the
 presence of

GEO. DICKENSON,

26, Princes Street, Bank.

WILLIAM NICHOLSON,

46, Gloucester Street, Queen Square.

AND BE IT REMEMBERED, that on the same Seventh day of July, in the year above mentioned, the aforesaid James Neville came before our Lord
 30 the King in His Chancery, and acknowledged the Specification aforesaid, and all and everything therein contained, in form above written. And also the Specification aforesaid was stamped according to the tenor of the Statute in that case made and provided.

Inrolled the same Seventh day of July, in the year above written.

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